

APPENDIX B**TREND ANALYSIS EXAMPLE**

The following is an example of an A-7 trend analysis that was developed by NADEP Jacksonville as part of their proactive RCM/AE program. The parameters which were analyzed are not the only ones to be considered. Other programs may choose to analyze other parameters, however, the basic trend analysis data plotting processes can be applied to any parameter.

THIS PACKAGE CONSISTS OF THE FOLLOWING WUCs:

29A7320 - Exhaust pipe
29Q2R - Old WUC for exhaust pipe

1. OUT OF LIMIT CONDITION: (as of quarter (qtr) ending 12/83)

<u>PARAMETER HISTORY</u>	<u>REMARKS</u>
FH/VF	Below lower control limit (LCL) 5 consecutive quarters Downward trend since last quarter of 1982

2. INVESTIGATION RESULTS:

a. The following are the scheduled maintenance requirements for the exhaust pipe.

- (1) Turnaround: Inspect for cracks and distortion (installed).
- (2) Forty-day: Inspect for corrosion (installed).
- (3) QECA (quick engine change assembly):
Fluorescent penetrant inspect exhaust duct weld beads.(500 hr interval)
X-Ray inspect repair welds in forward half of exhaust pipe. Visually inspect for damage (cracks, dents, warps, nicks, etc.).
- (4) Conditional: Fluorescent penetrant/visually inspect each exhaust pipe prior to installation. Refer to NA 01-45AAA-3-1.1, Section XII.

b. The increase in VF's was due to increases in Malfunction (MAL) codes 170 (corrosion) and 190 (cracked). Increases in When Discovered codes for inspection (K, L, M) indicate a probable

increase in inspections and depth of inspection. Emphasis was placed on proper inspections following investigations of in-flight failures.

c. A review of past EI reports indicated a failure mode resulting in sections of the exhaust pipe being lost in flight. The recommended corrective action to preclude exhaust pipe failure was to comply with existing maintenance requirements.

d. The primary failure mode of the exhaust pipe is cracking. The majority of failures reported at "O" level are MAL code 190. Related "I" level repairs are reported as C or B Action Taken codes, probably indicating weld repairs of the cracks. As the exhaust pipes age and repairs accumulate, an increasing cracking failure rate can be expected.

e. No life limit is currently imposed on the exhaust pipe although COMNAVAIRPAC recommended one in July 1982. (COMNAVAIRPAC 281809Z July 82).

f. It was noted that, due to limited access, only partial visual inspection of the exhaust pipe is possible during the turnaround and 40-day corrosion inspections. The only complete exhaust pipe inspections are during the 500-hour engine hot section inspection and prior to installation (conditional inspection).

g. Cannibalization actions were high during 1982 but were reduced in 1983 due to improved logistic support.

3. RECOMMENDATIONS:

a. Continue to monitor data.

b. Review RCM analysis to determine adequate maintenance requirements including investigating the possibility of establishing a service life limit for exhaust pipes.

4. ACTION REQUIRED:

a. Monitor data for problem areas. (Code 353).

b. Review and update RCM analysis. (Code 353).

5. STATUS:

a. (As of qtr ending 12/84) Status remains open with the following update:

(1) Continued monitoring of data for exhaust pipes revealed a continued high failure rate due to cracked pipes.

Corrosion reporting (Z-170) also remains high. Corrosion as a functional failure mode is very remote due to corrosion resistant metals used to manufacture pipes. The increasing incidence of exhaust pipe cracks appears to be related to the increasing age of the pipes.

(2) The RCM analysis was reviewed and current inspections are deemed appropriate for detection of potential failures. Most verified failures documented are considered potential failures.

(3) Exhaust pipes exceeding maximum repair limits are being condemned and surveyed. Replacement pipes are being provided through coordination with the Aviation Supply Office (ASO). As new pipes are introduced into the system, potential failures should decrease.

(4) Recommend continued monitoring of the data for expected improvement. Ensure appropriate criteria are utilized for rejection of nonserviceable exhaust pipes.

b. (As of qtr ending 12/85) Status remains open with the following update:

(1) FIGURES 1, 2 and 3 show below LCL for all 4 qtrs of 1985. The first qtr of 1985 appears to be a bottoming point.

(2) Expected improvement is apparently being realized. As the old tail pipes are being replaced continued improvement is expected.

(3) Continue to monitor, if system returns to within baselines, closure may be appropriate.

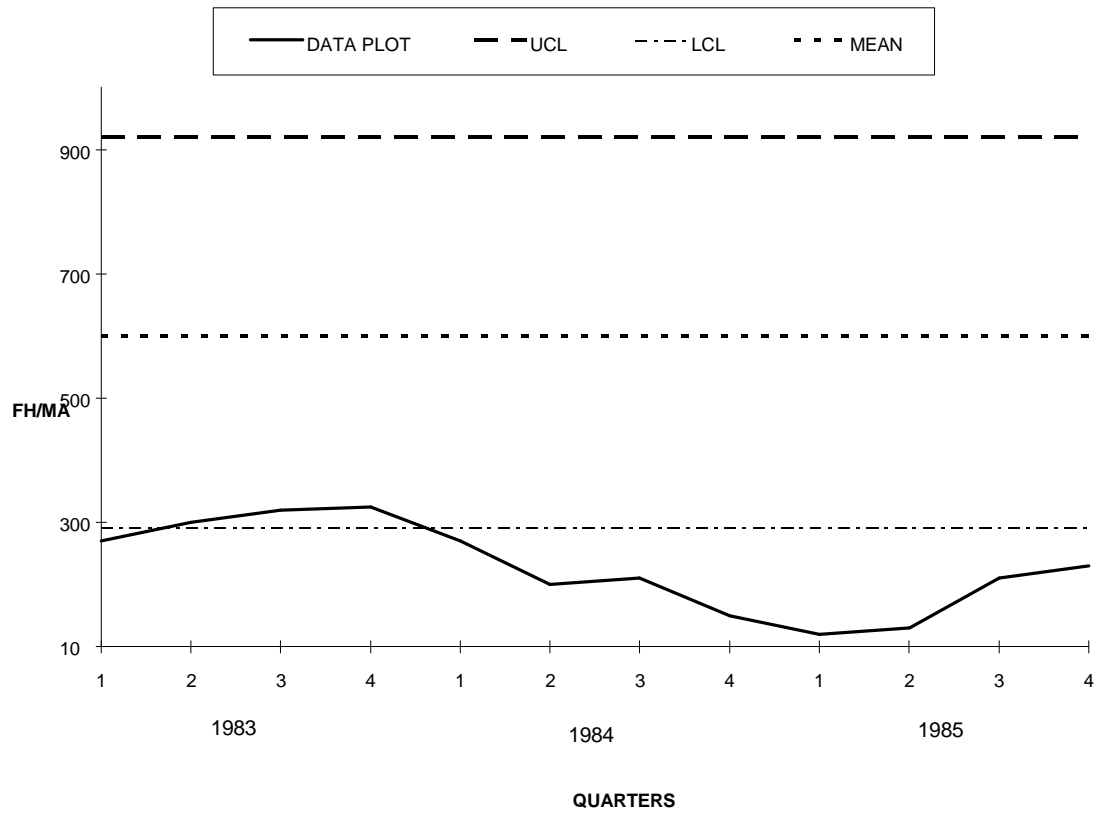


FIGURE 1. Performance Trend - 29Q2R FH/MA TEC AAF

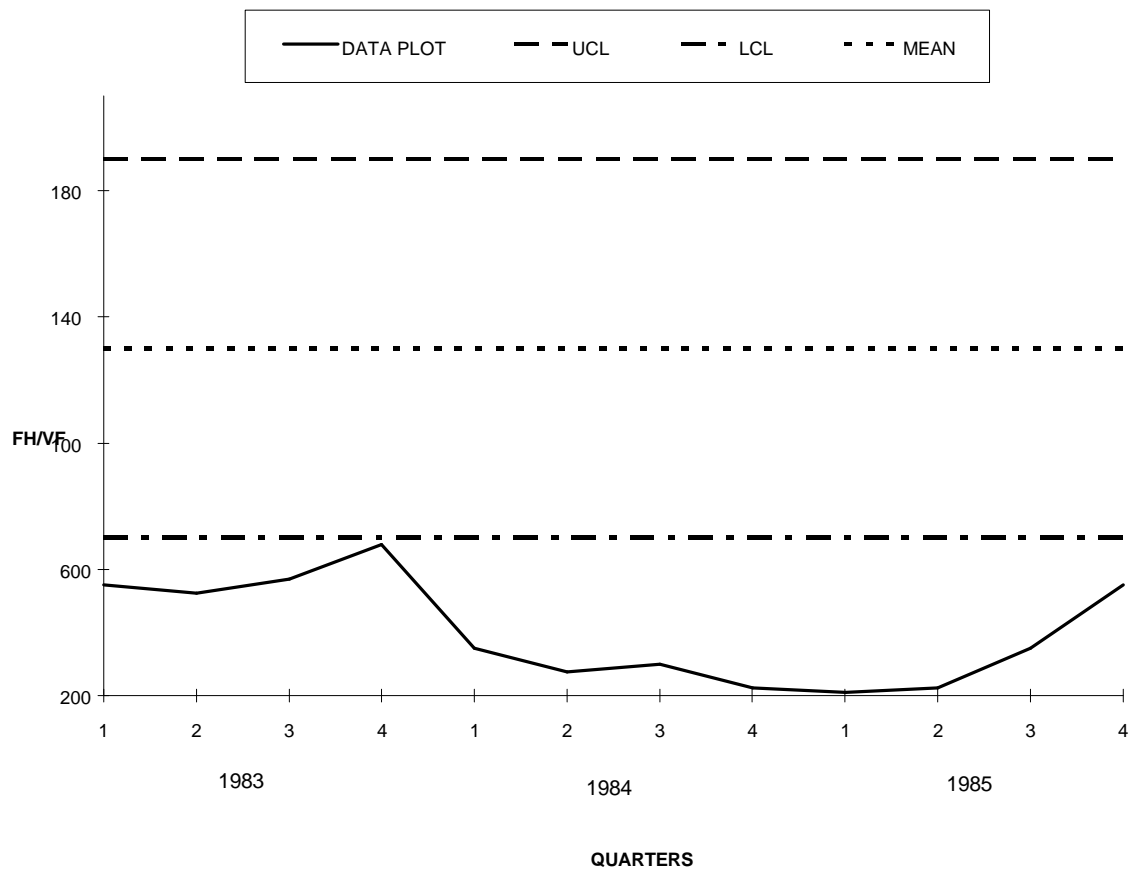


FIGURE 2. Performance Trend - 29Q2R FH/VF TEC AAF

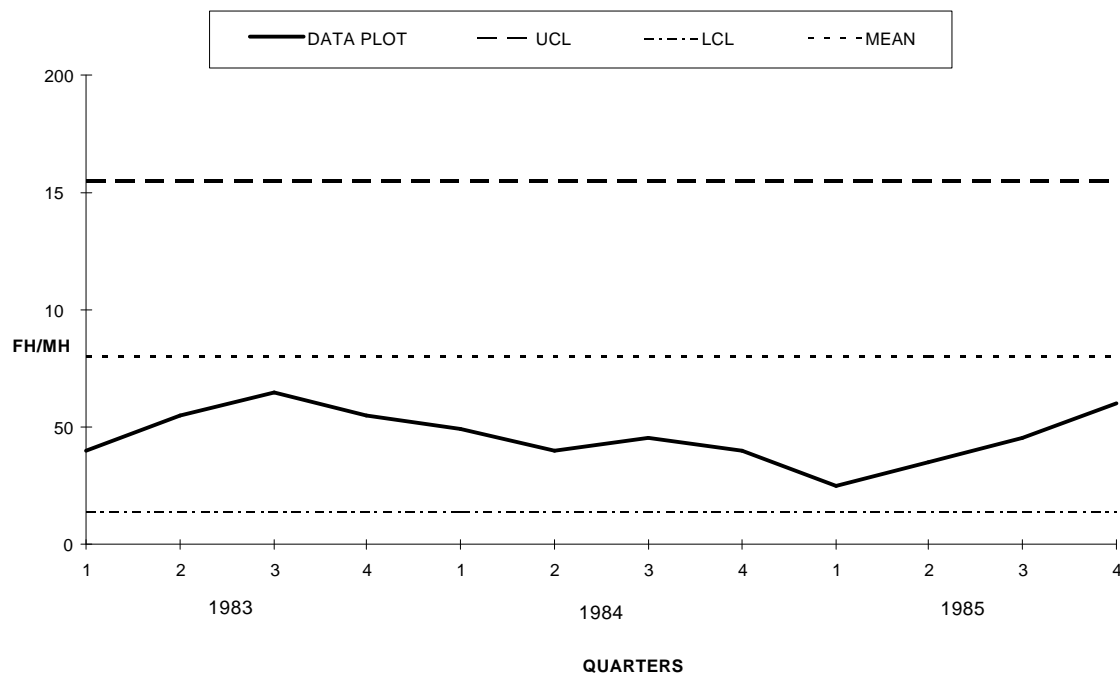


FIGURE 3. Performance Trend - 29Q2R FH/MH TEC AAF